

The Plymouth Student Scientist, 2010, **4**, (1), 276-292

Psychological flexibility, insomnia and chronic pain; a study of acceptance, mindfulness and values-based action

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Abstract

Whilst thought control strategies are becoming increasingly recognised as counterproductive, the role of psychological flexibility has been observed in depression, anxiety and chronic pain, however little research has considered its role in insomnia. It was hypothesised that psychological flexibility would predict levels of insomnia. Participants were 162 male and female adults seeking chronic pain treatment who completed a set of questionnaires measuring four variables of psychological flexibility and insomnia severity. Results indicated that measures of psychological flexibility were significantly correlated with measures of sleep quality. Multiple regression analysis revealed that collectively, chronicity of pain, usual pain intensity and measures of psychological flexibility accounted for 30.2% of the variance in insomnia severity scores. Further studies are needed to verify these results in order to effectively treat the problem of insomnia occurring secondary to chronic pain.

Ethics Statement

This study was complied in accordance of both the University of Plymouth ethical guidelines and the local and national ethics committees (Bath Research Ethics Committee and National Research Ethics Service). Data was collected using a pre-designed set of questionnaires given to patients attending an assessment at the Bath Centre for Pain Services.

The patients were sent a questionnaire pack to complete prior to their assessment. On Arrival participants returned the completed questionnaires to their assessing psychologist and signed a consent form if they agree for their data to be used. Participants were informed that their data may be used for both research purposes and treatment purposes and only be members of staff. Contact details were provided for those who wished to find out more about the use of their data or withdraw their data.

Participants were not exposed to any risk of harm greater than that in ordinary life. As completing the questionnaires involved personal and private information, participants were protected from stress through the reassurance that they were under no constraint to answer the questions.

All data collected will remain confidential and anonymous and participants will only be recognised by an identification number. A separate document containing participant's identification numbers with their corresponding name and date of birth will only be available to the experimenter and project supervisors.

Introduction

The occurrence of chronic pain is alarmingly common and the detrimental impact on the quality of life of those who are suffering well known (Breivik et al. 2006). As well as being the most common psychological complaint in the general population, insomnia also appears to be highly prevalent in those with chronic pain, with studies reporting between 50-88% of chronic pain patients complaining of significant difficulties sleeping (Smith & Haythornthwaite, 2004). Insomnia has been shown to cause significant distress to the sufferer in addition to social, interpersonal and occupational impairment. The most replicated finding in studies of insomniacs is that they report unpleasant intrusive thoughts and excessive worry during the pre-sleep period (Harvey, Tang, & Browning, 2005; Lichstein & Rosenthal, 1980; Morin, 1993). Cognitive models of insomnia assume that the development and maintenance of insomnia is a result of these unwanted thoughts and beliefs (Harvey, Tang & Browning, 2005). The natural response is the attempt to avoid or suppress these undesired cognitions, however, the counterproductive effects of this are becoming increasingly recognised. The term psychological flexibility is derived from Acceptance and Commitment Therapy (ACT) and refers to "the ability to be fully conscious and open to our experiences so we can act on our values (Harris, 2009, p.8). ACT attempts to encourage willingness to experience negative psychological events such as thoughts, beliefs or sensations, and has thus far demonstrated efficacy in relieving symptoms of anxiety, depression and chronic pain (Eifert et al. 2009; Forman et al. 2007; Vowles & McCracken, 2008). The underlying assumption of this therapy is that efforts to control and suppress unwanted thoughts and feelings is counterproductive and essentially exacerbates struggle and distress. Considering the co-morbidity of insomnia and chronic pain, it may be reasonable to assume that encouraging psychological flexibility, rather than psychological inflexibility, may be a promising method of relieving the disabling effects of these conditions.

Cognitive Models of Insomnia

Previous studies have suggested that the development and maintenance of insomnia encompasses a wide range of cognitive processes including beliefs, reasoning, memory, attributions, expectations, perception and attention. The role of cognitive processes in insomnia was first highlighted by Storms and Nisbett in 1970, who suggested that patients suffering from insomnia feel anxious and aroused prior to sleeping as they worry and ruminate about not being able to sleep (Storms & Nisbett, 1970, cited by Harvey, Tang & Browning, 2005). Testing their hypothesis, Storms and Nisbett administered a placebo tablet to insomnia patients, informing one half that the tablet would cause arousal and the other half that it would have a relaxing effect. Sleep onset latency was faster in those who were told the tablet would be arousing, which was explained to be as a result of this group attributing their arousal to the anticipated effects of the tablet; this, in turn, reduced their own anxiety therefore allowing faster sleep onset. The 1970's also saw a surge in research focusing on the role of perception in insomnia, suggesting that distorted perception of sleep is one of the main cognitive process pertaining to insomnia; a phenomena which is still being studied today (Bixler et al. 1973 cited by Harvey et al. 2005; Fichten et al. 2001; Tang and Harvey, 2004).

Research by Lichstein and Rosenthal (1980) found that in a sample of 296 insomniacs, cognitive arousal was ten times more likely to be stated as the major cause of insomnia in comparison to somatic arousal (Lichstein & Rosenthal, 1980, cited by Harvey et al. 2005). Findings by Sanavio (1988) and Van Egeren et al. (1983) highlighted a correlation between the content of pre-sleep thoughts rather than frequency of pre-sleep thoughts in insomniacs. As a result, the role of pre-sleep cognitions became an important interest for researchers. These findings were supported by Charles Morin using his measure of dysfunctional beliefs (Morin et al. 1993). In comparison to self-defined good sleepers, chronic insomniacs were more likely to endorse beliefs about the negative consequences of insomnia, express more hopelessness about losing control of their sleep and more helplessness about its unpredictability. Similar results were found when investigating catastrophic worry in patients with insomnia, who rated their chances of poor sleep higher and generated more catastrophes about not sleeping than good sleepers (Harvey & Greenall, 2003). This is in concordance with findings that a reduction in dysfunctional beliefs regarding sleep, as result of cognitive behavioural therapy for insomnia, was associated with positive post-treatment outcome (Edinger et al. 2001).

Recent cognitive models of insomnia have also recognised the presence of 'safety behaviours' in insomniacs (Bélanger et al. 2005; Harvey, 2002; Harvey & Greenall, 2003; Ree et al. 2005). Thought control as a safety behaviour is suggested to be a common feature in a range of psychological disorders, however, there has been much discussion as to whether the attempt to suppress thoughts is helpful or not and whether it is even possible to control what we think and feel (Bakker, 2009). The Thought Control Questionnaire Insomnia-Revised (TCQI-R; Ree et al. 2005) identified six factors involved in thought control; aggressive suppression, cognitive distraction, reappraisal, social avoidance, behavioural distraction and worry. Cognitive distraction (such as trying to think pleasant thoughts instead) appears to predict better sleep quality where as behavioural distraction (such as doing something enjoyable) predicts worse sleep quality (Ree et al. 2005). Furthermore, a higher frequency of aggressive suppression, behavioural distraction, social

avoidance and worry correlated with higher reports of anxiety and depression and, hence, poorer sleep quality. More recently, theorists and researchers of Acceptance and Commitment Therapy and Mindfulness have suggested that not only is thought suppression ineffective but it is also counterproductive. For example, the “white bear” studies of Wegner (1989, cited by Harvey et al. 2005) suggested that conscious attempts to suppress a thought are likely to result in paradoxical increases in frequency of the targeted thought. It is now widely acknowledged that suppressing unwanted thoughts often leads to a subsequent increase in the frequency of such thoughts and in turn results in higher levels of distress (Harvey, 2002; Hayes et al. 1999; Marcks & Woods, 2005). Highlighting its problematic consequences, Najmi, Riemann and Wegner (2009) boldly concluded that the attempt to control unwanted thoughts is “at best unsustainable and at worst counterproductive” (p.494).

Psychological Flexibility

Psychological flexibility refers to the ability to “be in the present moment with full awareness and openness to our experience, and to take action guided by our values” (Harris, 2009, p.12). This is in contrast to directing efforts towards the suppression of unwanted thoughts, avoidance of unpleasant feelings and sensations and distraction away from current experience as these behaviours interfere with long term values and goal pursuit. Psychological flexibility collectively describes the underlying processes of Acceptance and Commitment therapy (ACT). ACT is based on Relational Frame Theory (RFT) which recognises that the central component of human language and cognition is our ability to learn and relate events (Hayes et al. 2001, cited by Hayes et al. 2006). Consistent with the “white bear” studies of Wegner et al. (1987), the RFT assumes that elaborated relational networks rarely disappear and are often only further elaborated (Wilson & Hayes, 1996). This relates to one of the main underlying assumptions of ACT; control is the problem, and not the solution. For example, telling yourself not to think about chocolate cake usually fails as the instruction itself contains the item that is being avoided.

There are six core pathological processes thought to contribute to an individual’s struggle and for each there is a corresponding ACT based therapeutic process (Harris, 2009).

Cognitive fusion:

Cognitive fusion refers to the control an individual’s thoughts can have over their behaviour as they are ‘fused’ with their thoughts, feelings and beliefs. The therapeutic process for this is defusion which through the use of mindfulness meditation encourages the individual to separate or detach themselves from their thoughts and feelings and view them as just words.

Attachment to the conceptualized self:

This occurs when an individual becomes fused with their own self description which is often made up of negative thoughts and beliefs. The therapeutic process of self-as-context encourages recognition of the thinking self and the observing self as separate.

Unworkable action:

This describes the patterns of behaviour which pull an individual away from a valued way of living, for example drug taking or social withdrawal. This is tackled therapeutically with committed action which encourages the individual to take

effective action, guided by their values and goals, with the aim of enjoying a rich and meaningful life.

Lack of contact with personal values:

Learning to clarify what is truly important is an essential step towards leading a valued life.

Dominance of the conceptualized past and future:

This refers to an individual's loss of contact with the present moment as they dwell on the past or ruminate about the future. Contact with the present moment encourages the individual to consciously pay attention to the here-and-now experience instead of operating on 'auto-pilot'.

Experiential avoidance:

Emotional avoidance describes an individuals attempt to avoid, erase or suppress unwanted private experiences and is addressed therapeutically by encouraging acceptance of unpleasant and distressing thoughts, feelings, emotions, urges and sensations. Relinquishing the natural desire to struggle with these experiences and recognising them for what they are should in turn reduce their overwhelming effect on the individual. In summary, ACT serves to balance the acceptance and mindfulness processes with commitment and behavioural change processes.

Psychological flexibility and Insomnia

Acceptance and Commitment therapy has demonstrated efficacy in dealing with a variety of psychological conditions including anxiety, depression, and obsessive-compulsive disorder. (Eifert et al. 2009; Forman et al. 2007; Twohig, Hayes & Masuda, 2006). Lundh and Broman's (2000) cognitive model of insomnia proposes two key processes that are involved in the development and maintenance of insomnia; sleep-interfering processes and sleep-interpreting processes. Sleep-interfering processes include arousal-producing processes (either cognitive or physiological) and sleep-interpreting processes include misperceptions of sleep including dysfunctional beliefs, expectations and attributions. In contrast, Lundh argues that healthy presleep processes require cognitive deactivation, which involves a decrease in an individual's controlled information processing in parallel with physiological deactivation (Lundh, 2005). This process of cognitive activation is assumed to involve less verbal regulation and control than during daytime functioning, and more acceptance of spontaneously occurring mental and physiological processes (Espie, 2002). It is suggested that whilst most people engage in controlled processing (such a problem solving) during wake time, functional sleep processes should encourage de-arousal and failure to disengage will inhibit sleep-promoting processes. Considering mindfulness meditation encourages cognitive, behavioural and emotional, Espie (2002) proposed that it may be sufficient in training the ability to deactivate controlled information processing by learning to observe spontaneously occurring physical and psychological processing in a non-controlling or judgemental way. Few studies have examined the efficacy of mindfulness meditation in reducing problems and those that have are flawed. Mindfulness-based stress reduction (MBSR) employed to help sleeping problems in women with breast cancer found that those who reported greater mindfulness practice reported significant improvement in sleep quality (Shapiro et al. 2003). However, there were no significant differences between the MBSR group and control group and the treatment was not specifically designed for insomnia. Significant

improvements in sleep variables in a study using mindfulness therapy specifically adapted for insomnia, however there was no control group to compare efficiency (Heidenreich, 2003, cited by Lundh, 2005). A pilot study using ACT-inspired treatment for insomnia yielded promising results (Akerlund, Bolanowski & Lundh, 2004, cited by Lundh, 2005).

Psychological flexibility and Chronic Pain

Many forms of treatment for chronic pain focus on decreasing pain in the sufferer, which may be beneficial when eliminating pain is achievable and leads to better functioning in the long term. However, these types of treatment become problematic when attempts to alleviate pain do not succeed and instead the sufferer moves further and further away from doing the things that are important to them.

In contrast, ACT serves to decrease the distressing and disabling influences of pain rather than decreasing pain itself. Similar to the studies recognising the ineffectiveness of thought suppression, research has shown that attempts to control pain leads to less pain tolerance when compared to not attempting to control pain (Gutiérrez et al. 2004, Hayes et al. 1999b). Furthermore, studies have demonstrated that excessive avoidance of chronic pain can lead to greater suffering and disability (Asmundson et al. 1999, Bortz, 1984). A study of coping responses in individuals with chronic pain identified that those who reported higher levels of struggling to control pain also reported higher levels of pain, distress and disability (McCracken, Eccleston & Bell, 2005).

Recent research into the use of ACT in the management of chronic pain has revolved around two main therapeutic focuses; engagement in daily activity regardless of pain and willingness to have pain present without responding to it. A preliminary analysis of treatment outcomes for patients receiving an acceptance-based approach to chronic pain found significant improvements in emotional, social and physical functioning (McCracken, Vowles & Eccleston, 2005). These improvements remained consistent at the three month follow-up and improvements in most outcomes correlated with an increase in acceptance. Similar results were achieved in a study by Vowles and McCracken (2008), where there was a significant reduction in pain, depression, pain-related anxiety, disability and physical performance. Improvements were also found in terms of acceptance of pain and values-based action, which were associated with improvements in the other domains.

Both insomnia and chronic pain are known to have detrimental affects on various aspects of an individual's quality of life, including physical, social and emotional wellbeing and given the suggestion of a reciprocal relationship between sleep and pain this is a problem that needs to be addressed (Smith and Haythornthwaite, 2004). Problems sleeping, as experienced by chronic pain sufferers, include; later sleep onset, shorter sleep time, poor sleep quality, poor sleep efficiency and more frequent and longer awakenings after sleep onset (Tang, 2008). As such, having trouble sleeping appears to be a major source of distress for people living with chronic pain. For example, a study of patients seeking treatment for chronic pain reported that greater sleep disturbance was associated with, and predicted, greater pain, disability, physical symptoms of pain and depression (McCracken & Iverson, 2002). Additionally, sleep is often reported as a specific area in which chronic pain patients would like help (Casarett et al. 2001). What is even more striking is the prevalence of sleep disturbance (often similar to that of chronic insomnia) with

chronic pain, with some studies reporting occurrences as high as 88.9% (Breivik et al. 2006; McCracken & Iverson, 2002; Tang et al. 2007).

The assumption that “untreated insomnia could serve to aggravate pain perception and contribute to poorer physical and psychosocial functioning” (Tang, 2008), and that this relationship is reciprocal is becoming well-recognised. Research into the effects of total sleep deprivation and selective sleep interruption demonstrated a significant decrease in mechanical pain thresholds, highlighting the potential effects of sleep disturbances on pain responses (Hakkionen et al. 2001).

Whilst pain can clearly influence sleep in terms of physical effects and body sensations (see Smith and Haythornthwaite, 2004 for a review), pain has also been shown to contribute to sleep disturbances in terms of cognitive-behavioural processes. For example, a study of pre-sleep cognitions in patients with insomnia secondary to chronic pain found that general pain-related thoughts were reported by 36% whilst 26% reported thoughts about the experimental procedure (Smith et al. 2000). In addition, negative sleep-related thoughts were also reported by 26%. Furthermore, in comparison to individuals who suffer pain but are good sleepers, those who are poor sleepers with pain report more pain, pain-related disability, depression, pain-related anxiety and more dysfunctional beliefs about sleep (Ashworth, Davidson & Espie, 2010). These findings suggest that the content of pre-sleep cognitive arousal may be a contributing factor of sleep disturbance secondary to chronic pain.

Despite the wealth of studies reporting treatment efficacy of Acceptance and Commitment Therapy in various clinical problems, there is very little empirical evidence regarding psychological flexibility and Acceptance and Commitment Therapy with Insomnia. Therefore the purpose of this study is to examine whether psychological flexibility predicts the presence of insomnia. It is also assumed that higher levels of psychological inflexibility will be associated with higher levels of insomnia.

Methods

Participants

Participants were 162 (60 male, 102 female) adult patients seeking treatment for chronic pain at the Bath Centre for Pain Services (BCPS), Somerset. All patients attend an assessment prior to treatment and are asked to complete a questionnaire pack. All collected data is entered in to a database, from which I selected all adult patients (from 18 years) from May 2008 to August 2009. Participants were mostly white (93%) and ranged in age from 19 to 76 years ($M = 43.8$, $SD = 13.3$).

Participants presented a wide range of chronic pain conditions, but many were not able to provide an accurate diagnosis. The mean pain duration was 119 months ($SD = 122$, range = 9-720 months), with a mean usual pain intensity at 7.5 on a scale of 0 to 10 ($SD = 1.9$, range = 2-10). The average number of hours sleep per night was 5.25 ($SD = 2.5$, range 1-18). The majority of participants were married (52.2%), with 28.9% single, 15.1% divorced and 3.8% widowed. The majority also reported not working due to their pain (48.7%).

Measures

Each patient assessed provided information regarding their background characteristics such as age, gender and pain circumstances, They also provided an estimation of the duration of their pain and their usual pain intensity and current pain intensity on a scale of 0 (no pain) to 10 (worst pain possible). Their questionnaire pack included a series of measures of the primary psychological variables of interest in this study: mindfulness, psychological acceptance, chronic pain acceptance, and values-based action. All measures had been previously validated and tested for reliability.

- The Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) is a 15-item measure designed to measure the opposite of mindfulness, 'mindlessness', such as "I find myself doing things without paying attention". The items were averaged to form the total score and lower scores indicate higher levels of mindfulness.
- The Acceptance Action Questionnaire-II (AAQ-II; Bond et al. 2008) contains 10 items to assess the ability to accept undesirable thoughts and feelings and how they live a valued life with the difficult private experiences. The items are negatively phrased and rated on a scale from 1 (never true) to 7 (always true). The reversed items were added to give a total score. Higher scores represent higher levels of general acceptance where as lower scores represent lower levels of acceptance.
- The Chronic Pain Acceptance Questionnaire (CPAQ; McCracken, Vowles & Eccleston, 2004) is a 20-item scale designed to assess levels of acceptance to pain. It consists of two sub-scales; activity engagement and pain willingness which measure the tendency to perform activities in the presence of pain and the absence of attempts to control pain. Each item is rated on a scale of 0 (never true) to 6 (always true). The measure contains 9 negatively phrased items which were reversed and added to the remaining 11 items to form a total score.
- The Chronic Pain Value Inventory (CPVI; McCracken & Yang, 2006) was used to measure six value domains; intimate relationships, family, friends, work, health, and growth and learning. The items were rated according to how successfully the participants believed they have lived according to each value on a scale from 0 (not at all successful) to 5 (extremely successful). The mean rating for each participant was taken as the total success score.
- The Insomnia Severity Index (ISI; Bastien, Vallières & Morin, 2001) is a self-report measure designed to measure perceived sleep difficulties. The measure contains seven items with different anchors. Participants were asked to rate each item on a scale of 0 to 4 and the scored were added to give a total score. Higher scores represent higher levels of insomnia.
- The Sickness Impact Profile (SIP; Bergner, Bobbit & Carter, 1981) is a 136-item measure of the impact of illness on various domains of daily functioning. For the purpose of this study, only measures from the 7-item Sleep and Rest subscale were used. Participants were asked to endorse statements that described the level of functioning in terms of day and night sleep and rest. The

higher the amount of endorsed statements represents the higher the amount of negative impact their pain has had on the sleep and rest.

The questionnaire pack also included measures of sleep and rest, as well as participant's estimations of their average total sleep time and average time spent in bed.

Procedure

The ongoing collection of data from patients attending the BCPS has been approved by the Local Ethics Committee and written consent was obtained from all participants. Patients were sent their questionnaire packs to complete at home and returned upon assessment. All data was recorded and stored in a data base accessible only by staff at the centre. Each patient was given an identification number to be kept with the questionnaire data and their identity was kept in a separate database corresponding to their identification numbers.

Results

It was anticipated that psychological flexibility would predict the presence of insomnia in individuals with chronic pain. It was expected that that lower levels of psychological flexibility would predict higher levels of insomnia.

Measures of acceptance, mindfulness and values-based action were significantly correlated with measures of insomnia (see Table 1). Specifically, measures of pain acceptance using the Chronic Pain Acceptance Questionnaire (CPAQ) were significantly correlated with measures from the Insomnia Severity Index (ISI), $r = -.328$, $p \leq .001$. Measures of general acceptance using the Acceptance Action questionnaire (AAQ) were also significantly correlated with insomnia scores, $r = -.276$, $p \leq .01$. Additionally, results from Mindful Attention-Awareness Scale (MAAS) were also significantly correlated with measures of insomnia, $r = -.196$, $p \leq .01$. And finally, measures of values-based action from the Chronic Pain Value Inventory (CPVI) were significantly correlated with results from the ISI, $r = -.275$, $p \leq .001$. Modest yet significant correlations were also found among measures of psychological flexibility and measures from the Sickness Impact Profile – Sleep and Rest (SIP-SR) and the estimates sleep efficiencies. A Bonferroni correction would lead to an adjusted alpha calculated as $.05 \div 12 = .004$. Only six out of 12 coefficients in the correlation matrix met criteria at this more stringent level of significance, these are marked in Table 1 as significant at $p < .004$. Noticeably, after a Bonferroni correction is applied, measures of mindfulness were not significantly correlated with any of the sleep measures. All other measures of psychological flexibility were significantly correlated with the ISI and SIP-SR measures.

Table 1: Correlations of acceptance, mindfulness and values-based action with measures of sleep.

Measure	CPAQ	MAAS	AAQ	CPVI
ISI	-.328***	-.196*	-.276***	-.275***
SIP-SR	-.282***	-.098	-.275***	-.325***
SE	.222*	.021	.103	.254**

*** $p < .004$, two tails

** $p < .01$, two tails

* $p < .05$, two tails

Given that all measures of psychological flexibility predicted the presence of insomnia using the Insomnia Severity Index, a multiple aggression analysis was carried out in order to predict the extent to which each of the variables can predict levels of insomnia. The first predictor variable was chronicity of pain using the Stepwise method, and then usual pain intensity and total scores from the MAAS, CPVI, AAQ, and CPAQ were entered simultaneously using the Enter method. The dependent variable was the total score from the Insomnia Severity Index. The regression results are shown in Table 2. Chronicity of pain accounted for 4.9% of the variance in ISI scores ($R^2 = .049$), chronicity of pain and usual pain intensity accounted for 23.3% ($R^2 = .233$) and finally these variables with the measures of psychological flexibility accounted for 30.2% of the variance ($R^2 = .349$).

All predictors together account for more variance than chronicity of pain alone ($\Delta R^2 = .099$) however usual pain intensity accounts for the most change in variance ($\Delta R^2 = .201$) suggesting that whilst there may be a relationship between psychological flexibility and insomnia severity, pain intensity may play a greater role.

There is a positive relationship between measures of acceptance and insomnia severity ($b = .002$) suggesting that as general acceptance increases, insomnia severity will decrease. There is a negative relationship among measures of mindfulness, values-based action and pain acceptance and insomnia severity ($b = -.605$, $b = -1.011$, $b = -.040$, respectively) so it may be likely that as these measures of psychological flexibility decrease, insomnia severity will increase. These findings support the hypothesis that lower levels of psychological acceptance can predict higher levels of insomnia.

Table 2: Multiple regression analyses of acceptance, mindfulness, and values-based action with measures of sleep.

Sleep Measure	Predictor	Beta	R^2	ΔR^2
ISI	Model 1		.049	.049
	Chronicity of pain	-.009		
	Model 2		.250	.201
	Chronicity of pain	-.009		
	Usual pain intensity	1.095		
	Model 3		.349	.099
	Chronicity of pain	-.009		
	Usual pain intensity	1.095		
	Acceptance of pain	-.040		
	Psychological Acceptance	.002		
	Values-based action	-1.011		
	Mindfulness	-.605		

Discussion

The results of the study were consistent with previous research regarding psychological flexibility and the hypothesis that psychological flexibility predicts insomnia severity. A Pearson's correlation analysis found a significant relationship among all four measures of psychological flexibility (general psychological acceptance, mindfulness, values-based action and chronic pain acceptance) and levels of insomnia. Previous measures of psychological flexibility with chronic pain have demonstrated that greater psychological inflexibility (experiential avoidance and cognitive fusion) often correlate with greater struggle and suffering (McCracken & Velleman, 2010). On the other hand, studies which have attempted to increase psychological flexibility using Acceptance and Commitment Therapy (ACT) have shown this leads to less struggle and distress (Vowles & McCracken, 2010). A closer look at the regression analyses show that whilst psychological flexibility is likely to be a predicting factor, pain also plays a major role in the onset and maintenance of insomnia. Putting aside the evidence demonstrating the impact of pain on sleep, this is a plausible argument that cannot be refuted, as we would clearly expect the distressing and unpleasant experience of pain sensations to affect sleep. So whilst we cannot deny that pain significantly affects sleep, it be worthwhile attempting to help reduce suffering by directly addressing the problems of sleep using Acceptance and Commitment Therapy. Furthermore, the role of other contributing factors such as medication and daytime resting must not be overlooked.

Comparing the proposed cognitive processes and behaviours underlying those suffering with insomnia alongside the psychological processes of ACT seems promising in terms of treatment. Cognitive models of insomnia suggest that the problem is often maintained by sleep-interfering arousal processes and dysfunctional sleep-interpreting processes that mutually reinforce each other (Harvey & Greenall, 2003; Lundh & Broman, 2000; Morin et al. 1993). In response to these previous assumptions, increasing psychological flexibility through processes of ACT may be effective in promoting a more accepting approach to spontaneously occurring physical and psychological processes and in turn may help improve sleep efficiency. For example, consider the roles of experiential avoidance and cognitive fusion in the maintenance of insomnia. Experiential avoidance may refer to the individual's counterproductive attempts to eliminate or escape from unwanted pre-sleep thought, feelings and sensations. Similarly, cognitive fusion may occur as individual's become 'fused' with these undesired experiences. This may lead to thoughts such as "I must get at least 3 hours sleep" or "I must not think about the pain sensations in my left leg". Encouraging the recognition that control strategies are not working and the acceptance of spontaneously occurring unwanted thoughts and sensations may help reduce struggle and distress. As recognised by Lundh (2005, p.35), "mindful observation of these processes may be assumed to lead to the perception that presleep processes and sleep fluctuates naturally as the result of various kinds of external and internal events". Similar findings were found in a study by Ong, Shapiro, and Manber (2008) using thirty insomnia sufferers undergoing 6 weeks of treatment including mindfulness meditation and behavioural treatments for insomnia such as sleep restriction, sleep education, stimulus control and sleep hygiene. The combined treatments yielded significant pre-treatment to post-treatment results including a reduction in total wake time, somatic and cognitive pre-sleep arousal and negative sleep-related cognitions. Furthermore, the total number of mindful meditations was significantly correlated with scores from the Hyperarousal Scale ($r = -.38, p, .05$).

This initial study of psychological flexibility in relation to insomnia secondary to chronic pain has several limitations. Firstly, response rates differed greatly between different measures within the questionnaire as questions or sections were often missed. This can be explained by a number of factors. The whole questionnaire itself was 20 pages long, so respondents may have got bored of answering each question or may have simply accidentally missed questions. Alternatively, participants may have found the answers too difficult to answer or particularly challenging emotionally. The implications of this are that whilst one relationship may be represented by the majority of the sample, another may be represented less giving an inaccurate picture of the results.

Secondly, the sleep measures used may be criticised in terms of their reliability and validity in indicating the presence of insomnia. Whilst the Insomnia Severity Index (ISI) has been recognised as a valid instrument to measure perceived insomnia severity (Bastien, Vallières & Morin, 2001) its focus is on the impact of insomnia rather than the characteristics of insomnia. Similarly, the 'rest' section of the Sickness Impact Profile (SIP-SR) has a greater focus on daytime sleepiness and rest. Considering the assumed role of pre-sleep cognitive and somatic arousal in the development and maintenance of insomnia, these processes may give a better insight into individual's struggle with insomnia and its relation to their psychological flexibility or inflexibility. Measures such as the Pre-Sleep Arousal Scale (Nicassio et al. 1985), the Dysfunctional Beliefs and Attitudes About Sleep scale (Morin, 1993) and the Sleep Disturbance Questionnaire (Espie et al. 2000) may be used to assess beliefs, attitudes, expectations and attributions about sleep. The estimated sleep efficiency (SE) scores are based on very subjective opinions of sleeping and considering insomniacs are prone to distorted perceptions of sleep, particularly over-estimating their lack of sleep (Harvey, Tang & Browning, 2005) this report should be interpreted with caution. Future studies of psychological flexibility and insomnia should attempt to use both objective and subjective measures of sleep to give a more accurate indication of problems sleeping.

Whilst the large participant sample enables generalisation of the assumption that psychological flexibility is related to insomnia severity in chronic pain patients, a closer look at the components of the relationship might yield some interesting results. More qualitative analysis of individual cases would allow a closer look at the specific thoughts, feelings and body sensations underlying the individual's struggle with insomnia and chronic pain. This may encourage the development of more specific questionnaires measuring areas of psychological flexibility in this population so that the relationship may be better observed. More direct treatment for insomnia in chronic pain suffers using Acceptance and Commitment Therapy may also follow. Furthermore, it may be worthwhile investigating the role of other psychological disorders such as depression and anxiety and their role in the relationship.

Despite interest in cognitive processes and arousal processes in insomnia, little has happened in terms of treatment. As Lundh (2005) observes; the best validated treatment for insomnia is still the stimulus control procedure which was introduced over thirty years ago (Bootzin, 1972). More recent treatments such as Sleep Restriction Therapy (Spielman, Caruso, Glovinsky, 1987) and Cognitive-Behavioural Therapy (Edinger et al. 2001; Lundh, 1998) have demonstrated efficacy but not above that of the stimulus control procedure. Preliminary studies of Acceptance and Commitment Therapy and Mindfulness Meditation techniques for insomnia have

yielded promising results, however, they are often flawed in their methodology (Heidenrich, 2003, cited by Lundh, 2005; Shapiro et al. 2003). Furthermore, these initial studies often involve ACT or mindfulness meditation combined with more traditional behavioural treatments for insomnia. Considering the only moderate contribution of psychological flexibility as suggested by the findings of this study, it may be reasonable to agree with Lundh's proposal that acceptance- and mindfulness-based techniques might be best utilised as part of a combination of methods which may increase the efficacy of insomnia treatment (Lundh, 2005). With such disabling effects and high prevalence, effective and long lasting treatment of insomnia secondary to chronic pain needs to be addressed.

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